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FEDERAL COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS  
OF THE MESITA DEL GAVILAN 7 1/2-MINUTE QUADRANGLE,  
McKINLEY COUNTY, NEW MEXICO

[Report includes 9 plates]

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## INTRODUCTION

### Purpose

This text complements the Coal Resource Occurrence (CRO) and Coal Development Potential (CDP) maps of the Mesita del Gavilan 7 1/2 minute quadrangle, McKinley County, New Mexico. These maps and report are part of an evaluation of fifty-six 7 1/2 minute quadrangles in northwestern New Mexico which were completed under U. S. Geological Survey Contract No. 14-08-0001-17459 (see figs. 1 and 2).

The purpose of this Coal Resource Occurrence-Coal Development Potential program, which was conceived by Congress as part of its Federal Coal Leasing Amendments Act of 1976, is to obtain coal resource information and to determine the geographical extent of Federal coal deposits. In addition, the program is intended to provide information on the amount of coal recoverable by various mining methods and to serve as a guide for land-use planning.

The U. S. Geological Survey initiated the program by identifying areas underlain by coal resources. These areas were designated Known Recoverable Coal Resource Areas based on the presence of minable coal thicknesses, adequate areal extent of these coal deposits, and the potential for developing commercial quantities of coal at minable depths.

This report is limited to coal resources which are 3,000 ft (914 m) or less below ground surface. Published and unpublished public information was used as the data base for this study. No new drilling or field mapping was performed as part of this study, nor were any confidential data used.

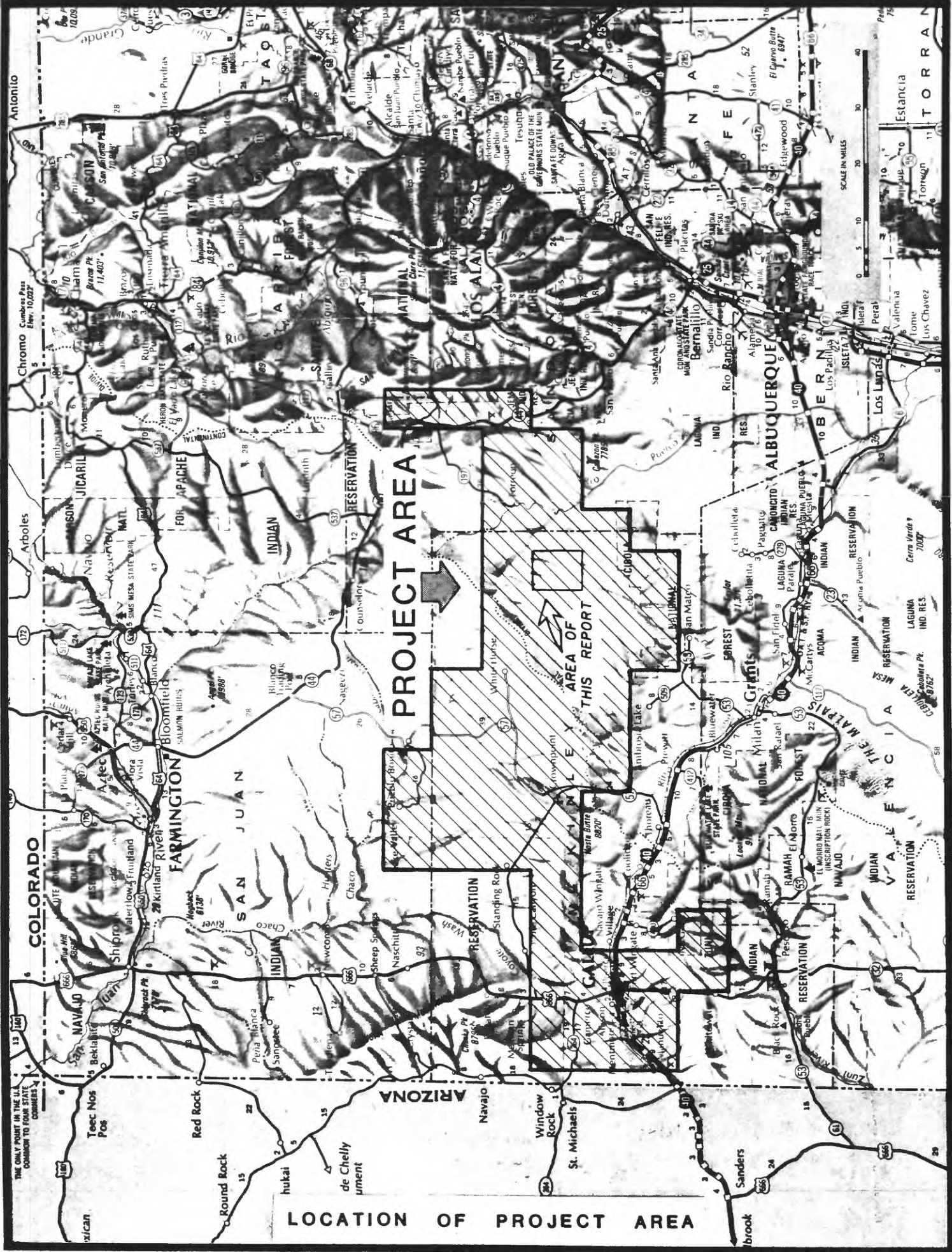
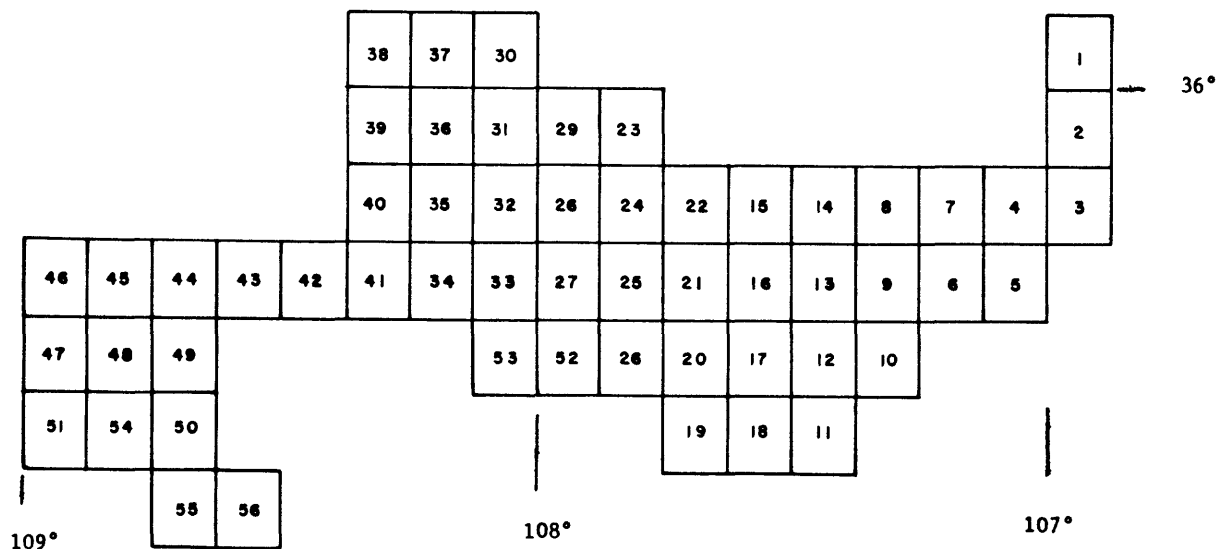


FIGURE 1

FIGURE 2.--Index to USGS 7 1/2-minute quadrangles and coal resource occurrence/  
coal development potential maps for the southern San Juan Basin area, New Mexico

Map No.	Quadrangle	Open-file report	Map No.	Quadrangle	Open-file report
1	Cuba	79- 623	31	Nose Rock	79- 641
2	San Pablo	79- 624	32	Becenti Lake	79-1124
3	La Ventana	79-1038	33	Heart Rock	79- 642
4	Headcut Reservoir	79-1043	34	Crownpoint	79-1125
5	San Luis	79-1044	35	Antelope Lookout Mesa	79-1376
6	Arroyo Empedrado	79-1045	36	Milk Lake	79-1377
7	Wolf Stand	79-1046	37	La Vida Mission	79-1378
8	Tinian	79- 625	38	The Pillar 3 SE	79-1379
9	Canada Calladita	79- 626	39	Red Lake Well	79-1380
10	Cerro Parido	79- 627	40	Standing Rock	79-1381
11	El Dado Mesa	79- 628	41	Dalton Pass	80- 026
12	Mesa Cortada	79- 629	42	Oak Spring	80- 027
13	Mesita del Gavilan	79- 630	43	Hard Ground Flats	80- 028
14	Rincon Marquez	79- 631	44	Big Rock Hill	80- 029
15	Whitehorse Rincon	79- 632	45	Twin Lakes	80- 030
16	Mesita Americana	79- 633	46	Tse Bonita School	80- 031
17	El Dado	79- 634	47	Samson Lake	80- 032
18	Cerro Alesna	79- 635	48	Gallup West	80- 033
19	San Lucas Dam	79- 636	49	Gallup East	80- 034
20	Piedra de la Aguila	79-1039	50	Bread Springs	80- 035
21	Hospah	79- 637	51	Manuelito	80- 036
22	Whitehorse	79-1040	52	Borrogo Pass	80- 037
23	Seven Lakes NE	79- 638	53	Casamero Lake	80- 038
24	Kin Nahzin Ruins	79- 639	54	Twin Buttes	80- 039
25	Orphan Annie Rock	79-1041	55	Pinehaven	80- 040
26	Mesa de los Toros	79-1122	56	Upper Nutria	80- 041
27	Laguna Castillo	79- 640			
28	Seven Lakes	79-1042			
29	Seven Lakes NW	79-1123			
30	Kin Klizhin Ruins	79-1047			



## Location

The Mesita del Gavilan 7 1/2 minute quadrangle includes acreage in Tps. 16, 17, and 18 N., Rs. 5 and 6 W. of the New Mexico Principal Meridian, McKinley County, northwestern New Mexico (see figs. 1 and 2).

## Accessibility

No paved roads pass through the Mesita del Gavilan quadrangle. Unimproved dirt roads traverse most portions of the area, and provide access to State Highway 53 about 28 mi (45 km) southwest of the quadrangle. The Atchison, Topeka, and Santa Fe Railroad line parallels Interstate Highway 40 about 42 mi (68 km) south of the Mesita del Gavilan quadrangle (see fig. 1)

## Physiography

The Mesita del Gavilan quadrangle is within the Navajo section of the southernmost part of the Colorado Plateau physiographic province (U. S. Geological Survey, 1965). The quadrangle is characterized by rugged, vegetated mesas dissected by numerous arroyos. Elevation within the quadrangle range from less than 6,220 ft (1,896 m) at the eastern quadrangle boundary along Arroyo Chico to over 6,960 ft (2,121 m) in the northeastern corner.

Local drainage is provided by Arroyo Chico, North Fork of the Arroyo Chico, and Arroyo Rincon Marquez. There are no perennial streams in the quadrangle.

## Climate

The climate of this area is semiarid to arid. The following temperature and precipitation data were reported by the National Oceanic and Atmospheric Administration for the Torreon Navajo Mission Station. The Mesita del Gavilan quadrangle is about 9 mi (14 km) SW. of the Torreon Navajo Mission Station. Average total annual precipitation for thirteen of the previous fifteen years is 9.94 in. (25.25 cm). Intense thunderstorms in July, August, and September account for the majority of precipitation. The area is susceptible to flash flooding associated with these thunderstorms. Mean annual temperature for eleven of the previous fifteen years is 49.5<sup>0</sup> F (9.7<sup>0</sup> C). The average daily temperatures in January and July are 27.4<sup>0</sup> F (-2.6<sup>0</sup> C) and 72.7<sup>0</sup> F (22.6<sup>0</sup> C), respectively.

## Land status

The Federal Government holds coal rights to approximately 40 percent of the Mesita del Gavilan quadrangle. For the specific coal ownership boundaries, see plate 2. It is not within the scope of this report to provide detailed land-surface ownership. All of the quadrangle is within the La Ventana and Hospah Known Recoverable Coal Resource Areas. As of October 26, 1978, there were no Federal coal leases, coal preference right lease applications or coal exploration licenses within the Mesita del Gavilan quadrangle.

## GENERAL GEOLOGY

### Previous work

Early reports on the area include that of Gardner (1910) who reported several coal measurements in the vicinity of the Mesita del Gavilan quadrangle. Hunt (1936) mapped a Menefee Cleary coal outcrop in the southwestern part of the quadrangle. Shomaker, Beaumont, and Kottlowski (1971) suggest that detailed fieldwork might locate Menefee Cleary coals with strippable potential in the area. Shomaker and Whyte (1977) estimate Menefee Formation coal resources of 1.30 million short tons (1.18 million t) at depths of 0 to 500 ft (0 to 152 m) for T. 17 N., R. 5 W. About 35 percent of T. 17 N., R. 5 W., is within the Mesita del Gavilan quadrangle. Tabet and Frost (1979) mapped the geology including coal outcrops in part of the Mesita del Gavilan quadrangle. Their study was completed after the compilation of these maps and their open file report should be consulted for additional coal data in this quadrangle.

### Stratigraphy

Within the San Juan Basin, the shoreline positions of the Cretaceous seaways changed innumerable times. The overall regional alignment of the shorelines trended N. 60° W. - S. 60° E. (Sears, Hunt, and Hendricks, 1941). The transgressive and regressive shoreline migrations are evidenced by the intertonguing relationships of continental and marine facies. Rates of trough (geosynclinal) subsidence and the availability of sediment supplies are the major factors that controlled the transgressive-regressive shoreline sequences.

Exposed rock units in the Mesita del Gavilan quadrangle include some of the sedimentary units of Upper Cretaceous age. Quaternary deposits

include alluvium and terrace gravels of the North Fork Arroyo Chico and Arroyo Alfredo Padilla.

The Upper Cretaceous Point Lookout Sandstone is a prominent sandstone marker in most of the San Juan Basin and represents nearshore or littoral deposits which formed during the most extensive northeastward retreat prior to the final withdrawal of the Cretaceous seaways in the San Juan Basin (Sears, Hunt, and Hendricks, 1941). Light gray to reddish-brown, fine-to medium-grained sandstone with interbedded shales comprise the lithologies of the Point Lookout Sandstone. Thickness of the unit ranges from 100 to 150 ft (30 to 46 m) locally. The continental sediments deposited inland from the beach area during deposition of the Point Lookout Sandstone compose the overlying Menefee Formation.

The Menefee Formation consists of dark gray to brown carbonaceous to noncarbonaceous shales, light gray sandstones, and coal beds, and is divisible into the basal Cleary Coal Member and upper Allison Member. A massive channel sandstone sequence, which crops out in the northern part of this quadrangle, defines the boundary between the two members. The Cleary Coal Member is 325 to 400 ft (99 to 122 m) thick locally. All of the identified coals in this quadrangle occur within the lower 203 ft (62 m) of the Cleary Coal Member. Erosion has reduced the Allison Member thickness to about 100 ft (30 m) in this area. No Allison Member coals have been identified in the quadrangle, and if coals exist they are apparently concealed by surficial deposits.

## Depositional environments

The Cretaceous System sedimentary units in the quadrangle represent transgressive and regressive depositional conditions. There were innumerable minor cycles of widely varying duration and extent within the major sedimentary sequences. The paucity of data in this quadrangle and the intended scope of this report permit only general interpretations of the depositional environments.

The Cretaceous coal deposits of the San Juan Basin are products of former coastal swamps and marshes. These swamps and marshes were supported by heavy precipitation and a climate conducive to rapid vegetal growth in moderately fresh water. Due to the relatively low sulfur contents of the San Juan Basin coals, Shomaker and Whyte (1977) suggest the coals formed in fresh water environments.

Most of the coal-bearing units were deposited in coastal plain environments. The majority of the peat deposits formed in a transition zone between lower and upper deltaic sediments during periods of relative shoreline stability. Coals also formed in lake margin swamps inland from the coastal area. Shoreline oscillations and the subsequent influx of continental or marine debris upon the peat accumulations produced the vertical buildup or "stacking" of peat deposits. This sediment debris represents variable ash contents, rock partings, and splits within the coal seams.

The peat accumulated in lenses or pods which were generally parallel to the ancient shorelines. The coals in the lower portions of the coal-bearing units represent regressive depositional conditions (Sears, Hunt, and Hendricks, 1941). The coals in the upper portions of these units are relatively sporadic in occurrence.

## Structure

The Mesita del Gavilan quadrangle is in the Chaco Slope structural division in the southeastern portion of the structural depression known as the San Juan Basin (Kelley, 1950). The uplifted and eroded San Miguel Creek Dome is directly south of the quadrangle and influences dips in the southwestern part of the quadrangle. Hunt (1936) mapped several low displacement faults in the area, which form horsts and grabens. Dips in the area of the San Miguel Creek Dome are  $3^{\circ}$  to  $4^{\circ}$  N. to NE. The structure contour map (plate 5) indicates dips of  $1^{\circ}$  north in the southern part of the Mesita del Gavilan quadrangle.

## COAL GEOLOGY

In this quadrangle, the authors identified two coal beds and one coal zone from oil and gas well logs and Hunt's (1936) surface mapping. These beds and zone are here informally called the Menefee Cleary No. 1 and No. 2 coal beds, and the Menefee Cleary coal zone.

The Menefee Cleary No. 1 coal bed is stratigraphically the lowest persistent bed identified, and occurs up to 5 ft (2 m) above the Point Lookout Sandstone in this quadrangle. In nearby quadrangles, the bed is up to 15 ft (5 m) above the Point Lookout Sandstone. The Menefee Cleary No. 2 bed is the second persistent Cleary Coal Member bed which is 9 to 17 ft (3 to 5 m) above the Point Lookout Sandstone in this quadrangle. These beds are inferred to be continuous although they may be several individual coal beds that are stratigraphically equivalent.

The Menefee Cleary coal zone contains three beds, the uppermost of which is 203 ft (62 m) above the Point Lookout Sandstone. These zone coals may be correlated for limited distances in portions of the area but they lack sufficient continuity with poorly defined stratigraphic position and cannot be designated as persistent coal beds.

There are no published coal quality analyses for coal beds from the Mesita del Gavilan quadrangle. Analyses of three core samples (from one coal test hole) of Allison Member coals sampled about 10 mi (16 km) north-east of the Mesita del Gavilan quadrangle, have been reported by Shomaker and Whyte (1977) and are shown in table 1. The Allison Member beds analyzed are probably similar in quality to the Cleary Coal Member beds in this quadrangle. Rank of the Cleary Coal Member seams is probably high volatile C bituminous in this area.

#### Menefee Cleary No. 2 coal bed

The Menefee Cleary No. 2 coal bed is the thickest identifiable coal bed in the quadrangle. However, due to sparse subsurface information, coal thickness and areal extent are approximated. Plate 4 indicates the bed to be a lenticular pod with the long axis aligned roughly parallel to the ancient shoreline. The bed is shown to pinch out in all directions in the subsurface (plate 4) because of limited data.

In drill hole No. 1, the coal bed was mapped as 4.0 ft (1.2 m) on plate 4 because a 3.0 ft (0.9 m) rock parting is present between the 2.0 ft and 4.0 ft (0.6 and 1.2 m) coal benches. The procedure prescribed by the U. S. Geological Survey regarding rock partings in coal beds with 200 ft (61 m)

Table 1. - Analyses of coal samples from the Allison Member of the Menefee Formation.

(Core sample from NE $\frac{1}{4}$  NE $\frac{1}{4}$  NE $\frac{1}{4}$  sec. 11, T. 18 N., R. 5 W.)

[Form of analysis: A, as received; B, moisture free; C, moisture and ash free]

from Shomaker and Whyte, 1977

Sample	Form of Analysis	Proximate analysis (percent)				Sulfur	Heating Value (Btu/lb)
		Moisture	Volatile Matter	Fixed Carbon	Ash		
1	A	12.0	34.1	39.9	14.0	0.3	10,410
	B	----	38.7	45.4	15.9	0.4	11,830
	C	----	46.1	53.9	----	0.5	14,070
2	A	13.0	34.7	33.8	18.5	0.3	9,550
	B	----	39.8	39.0	21.2	0.4	10,980
	C	----	50.6	49.4	----	0.5	13,940
3	A	11.0	34.4	35.1	19.5	0.4	9,800
	B	----	38.7	39.4	21.9	0.5	11,020
	C	----	49.5	50.5	----	0.6	14,100

Remarks:

A moist, mineral-matter-free (MMMF) calculation, using the Parr formula (American Society for Testing and Materials, 1973), yields heating values of 12,270 Btu/lb (28,540 kJ/kg; sample 1), 11,940 Btu/lb (27,772 kJ/kg; sample 2) and 12,432 Btu/lb (28,917 kJ/kg; sample 3). No agglomerating characteristics are available for these analyses.

or more of overburden is that the rock split must be greater than one coal bench to discount the thinner coal bench.

## COAL RESOURCES

The U. S. Geological Survey requested a resource evaluation of the Menefee Cleary No. 2 coal bed, where the bed is 3.0 ft (0.9 m) or more thick. The evaluation is restricted to Federal coal lands.

The following procedures were prescribed by the U. S. Geological Survey for the calculation of reserve base. Criteria established in U. S. Geological Survey Bulletin 1450-B were used to areally divide the bed into measured, indicated, and inferred reserve base categories. Reserve base was calculated for each category, by section, using data from the isopach and overburden maps (plates 4 and 6). The acreage in each category (measured by planimeter) multiplied by the average coal bed thickness and a bituminous coal conversion factor (1,800 tons of coal per acre-ft) yields the reserve base for that category. Coal beds with 3.0 ft (0.9 m) minimum thickness are included in reserve base and reserve data rather than the 28 in. (71 cm) minimum thickness prescribed in U. S. Geological Survey Bulletin 1450-B. Reserve figures are derived from reserve base totals by applying recovery factors of 85 percent and 50 percent for coal beds 0 to 200 ft (0 to 61 m) and 200 to 3,000 ft (61 to 914 m) deep, respectively. All reserve base and reserve values are rounded to the nearest 10,000 short tons (9,072 t).

Total reserve base data for the Menefee Cleary No. 2 coal bed, which include all reserve base categories, are shown by section on plate 2. Reserve base and reserve data in the various categories are shown on plate 7.

## COAL DEVELOPMENT POTENTIAL

The factors used to determine the development potential are the presence of a potentially coal-bearing formation, and the thickness and overburden of correlative coal beds. The U. S. Geological Survey supplied the criteria to evaluate the coal development potential for Federal lands in this quadrangle. These criteria are based on current industry practice, U. S. Geological Survey Bulletin 1450-B, and anticipated technological advances. All available data were utilized for the surface and subsurface coal development potential evaluations.

Any area underlain by a potentially coal-bearing formation with 200 ft (61 m) or less of overburden has potential for surface mining. The U. S. Geological Survey designated the 200 ft (61 m) maximum depth as the stripping limit. Areas where a potentially coal-bearing formation is overlain by more than 200 ft (61 m) of overburden have no potential for surface mining. Areas with no correlative coal bed or a correlative coal bed less than 3.0 ft (0.9 m) in thickness and overlain by 200 ft (61 m) or less of overburden have unknown surface mining potential. Areas which have a correlative coal bed 3.0 ft (0.9 m) or more thick with surface mining potential are assigned a high, moderate or low development potential based on the mining ratio (cubic yards of overburden per short ton of recoverable coal). The formula used to calculate mining ratios is:

$$MR = \frac{t_o(C)}{t_c(Rf)}$$

Where MR = Mining ratio

$t_o$  = Thickness of overburden in feet

$t_c$  = Thickness of coal in feet

Rf = Recovery factor

C = Volume-weight conversion factor

(.896 yd<sup>3</sup>/short ton for bituminous coal)

(.911 yd<sup>3</sup>/short ton for subbituminous coal)

High, moderate, and low development potential areas have respective surface mining ratio values of 0 to 10, 10 to 15, and greater than 15.

Any area underlain by a potentially coal-bearing formation with 200 to 3,000 ft (61 to 914 m) of overburden has potential for subsurface mining. Areas where a potentially coal-bearing formation is overlain by more than 3,000 ft (914 m) of overburden have no subsurface mining potential. Development potential for subsurface mining is unknown where a potentially coal-bearing formation within 200 to 3,000 ft (61 to 914 m) of the surface contains no identified correlative coal bed or a correlative coal bed less than 3.0 ft (0.9 m) thick. High, moderate, and low development potential areas have respective overburden values of 200 to 1,000 ft (61 to 305 m), 1,000 to 2,000 ft (305 to 610 m), and 2,000 to 3,000 ft (610 to 914 m).

Boundaries of coal development potential areas coincide with the boundaries of the smallest legal land subdivision (40 acre lot). When a land subdivision contains areas with different development potentials, the potential shown on the map is that of the areally largest component area. When an area is underlain by more than one bed, the potential shown on the map is that of the bed with the highest potential.

Reserve base (in short tons) in the various development potential categories for surface and subsurface mining methods are shown in tables 2 and 3, respectively.

The coal development potential maps are subject to revision. Map boundary lines and reserve base values are based on coal resource occurrence map isopachs, overburden isopachs, and coal bed correlations that are interpretive and subject to change as additional coal information becomes available.

#### Development potential for surface mining methods

The coal development potential for surface mining methods in the Mesita del Gavilan quadrangle is shown on plate 8. All Federal coal lands, where the Menefee Cleary No. 2 coal bed is 3.0 ft (0.9 m) or more thick, have mining ratios greater than 15 and have low development potential for surface mining methods. Refer to table 4 for reserves and planimetered acreage, by section, for Federal coal lands with development potential for surface mining methods. The remainder of the Federal coal land in the Mesita del Gavilan quadrangle has unknown development potential for surface mining methods.

## Development potential for subsurface mining methods and in situ gasification

The coal development potential for subsurface mining methods in the Mesita del Gavilan quadrangle is shown on plate 9. All Federal coal lands, where the Menefee Cleary No. 2 coal bed is 3.0 ft (0.9 m) or more thick, have high development potential for subsurface mining methods. Refer to table 5 for reserves and planimetered acreage, by section, for Federal coal lands with subsurface mining potential. The remainder of the Federal land in the Mesita del Gavilan quadrangle has unknown development potential for subsurface mining methods.

In situ gasification of coal has not been done on a commercial scale in the United States and criteria for rating the development potential of this method are unknown.

Table 2. - Reserve base data (in short tons) for surface mining methods for Federal coal lands in the Mesita del Gavilan quadrangle, McKinley County, New Mexico.

[Development potentials are based on mining ratios (cubic yards of overburden/ton of underlying coal). To convert short tons to metric tonnes, multiply by 0.9072; to convert mining ratios in yds<sup>3</sup>/ton coal to m<sup>3</sup>/t, multiply by 0.842].

Coal Bed	High Development Potential (0-10 Mining Ratio)	Moderate Development Potential (10-15 Mining Ratio)	Low Development Potential (greater than 15 Mining Ratio)	Total
Menefee Cleary No. 2	---	---	1,500,000	1,500,000
Total	---	---	1,500,000	1,500,000

Table 3. - Reserve base data (in short tons) for subsurface mining methods for Federal coal lands in the Mesita del Gavilan quadrangle, McKinley County, New Mexico.

[Development potentials are based on thickness of overburden. To convert short tons to metric tonnes, multiply by 0.9072].

Coal Bed	High Development Potential (200'-1,000' overburden)	Moderate Development Potential (1,000'-2,000' overburden)	Low Development Potential (2,000'-3,000' overburden)	Total
Menefee Cleary No. 2	14,460,000	---	---	14,460,000
Total	14,460,000	---	---	14,460,000

Table 4. - Reserves and planimetered acreage, by section, for Federal coal lands in the Mesita del Gavilan quadrangle with surface mining potential.

[To convert acres to hectares, divide acres by 2.471; to convert short tons to metric tonnes, multiply short tons by 0.9072].

Potential category	Coal bed	Sec.	T. N.	R. W.	Acres (planimetered)	Reserves (in short tons)
Low	Menefee Cleary No. 2	6	16	5	14.9	90,000
		12	16	6	172.2	1,190,000

Table 5. - Reserves and planimetered acreage, by section, for Federal coal lands in the Mesita del Gavilan quadrangle with subsurface mining potential.

[To convert acres to hectares, divide acres by 2.471; to convert short tons to metric tonnes, multiply short tons by 0.9072].

Potential category	Coal bed	Sec.	T. N.	R. W.	Acres (planimetered)	Reserves (in short tons)
High	Menefee Cleary No. 2	5	16	5	10.5	30,000
		6			279.3	1,050,000
		7			593.6	2,720,000
		8			280.5	1,030,000
		12	16	6	195.3	750,000
		34	17	6	262.6	830,000
		35			235.0	800,000

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## GLOSSARY

- coal bed--A stratified sequence of coal, composed of relatively homogeneous material, exhibiting some degree of lithologic unity and separated from the rocks above and below by physically rather well defined boundary planes.
- coal bed separation line--A line on a map plate separating areas where different coal beds or zones are mapped.
- coal bench--One of two or more divisions of a coal bed separated by rock.
- coal conversion factor--A factor used to convert acre-feet of coal into short tons of coal; bituminous coal is 1800 tons/acre-ft; subbituminous coal is 1770 tons/acre-ft.
- coal development potential--A subjective determination of the comparative potential of Federal coal lands for development of a commercially viable coal mining operation.
- coal exploration license--An area of Federal coal lands in which the licensee is granted the right, after outlining the area and the probable methods of exploration, to investigate the coal resources. An exploration license has a term not to exceed 2 years and does not confer rights to a lease.
- coal lease--An area of Federal coal lands in which the Federal Government has entered into a contractual agreement for development of the coal deposits.
- coal split--A coal bed resulting from the occurrence of a noncoal parting within the parent coal bed which divides the single coal bed into two or more coal beds.
- coal zone--A distinctive stratigraphic interval containing a sequence of alternating coal and noncoal layers in which the coal beds may so lack lateral persistence that correlating individual beds in the zone is not feasible.
- Federal coal land--Land for which the Federal Government holds title to the coal mineral rights, without regard to surface ownership.
- hypothetical resources--Undiscovered coal resources in beds that may reasonably be expected to exist in known mining districts under known geologic conditions. In general, hypothetical resources are in broad areas of coal fields where points of observation are absent and evidence is from distant outcrops, drill holes or wells. Exploration that confirms their presence and reveals quantity and quality will permit their reclassification as a Reserve or Identified Subeconomic Resource.
- identified resources--Specific bodies of coal whose location, rank, quality, and quantity are known from geologic evidence supported by engineering measurements.
- indicated--Coal for which estimates for the rank, quality, and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections.
- inferred--Coal in unexplored extensions of demonstrated resources for which estimates of the quality and quantity are based on geologic evidence and projections.
- isopach--A line joining points of equal bed thickness.
- Known Recoverable Coal Resource Area (KRCRA)--Formerly called Known Coal Leasing Area (KCLA). Area in which the Federal coal land is classified (1) as subject to the coal leasing provisions of the Mineral Leasing Act of 1920, as amended, and (2) by virtue of the available data being sufficient to permit evaluation as to extent, location, and potential for developing commercial quantities of coal.
- measured--Coal for which estimates for rank, quality, and quantity can be computed, within a margin of error of less than 20 percent, from sample analyses and measurements from closely spaced and geologically well known sample sites.
- mining ratio--A numerical ratio equating the in-place volumes, in cubic yards, of rocks that must be removed in order to recover 1 short ton of coal by surface mining.
- overburden--A stratigraphic interval (composed of noncoal beds and coal beds) lying between the ground surface and the top of a coal bed. For coal zones, overburden is the stratigraphic interval lying between the ground surface and the structural datum used to map the zone.
- parting--A noncoal layer occurring along a bedding plane within a coal bed.
- Preference Right Lease Application (PRLA)--An area of Federal coal lands for which an application for a noncompetitive coal lease has been made as a result of exploration done under a coal prospecting permit. PRLA's are no longer obtainable.
- quality or grade--Refers to measurements such as heat value; fixed carbon; moisture; ash; sulfur; phosphorus; major, minor, and trace elements; coking properties; petrologic properties; and particulate organic constituents.
- rank--The classification of coal relative to other coals, according to degree of metamorphism, or progressive alteration, in the natural series from lignite to anthracite (Classification of coals by rank, 1973, American Society for Testing and Materials, ASTM Designation D-388-66).
- recovery factor--The percentage of total tons of coal estimated to be recoverable from a given area in relation to the total tonnage estimated to be in the Reserve Base in the ground.
- reserve--That part of identified coal resource that can be economically mined at the time of determination. The reserve is derived by applying a recovery factor to that component of the identified coal resource designated as the reserve base.
- reserve base--That part of identified coal resource from which Reserves are calculated.
- stripping limit--A vertical depth, in feet, measured from the surface, reflecting the probable maximum, practical depth to which surface mining may be technologically feasible in the foreseeable future. The rock interval, expressed in feet, above the stripping limit is the "strippable interval."
- structure contour--A line joining points of equal elevation on a stratum or bed.